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TITLE: Reinforced thermoplastic composition and articles derived therefrom

PUBLICATION-DATE: November 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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US-CL-CURRENT: 525/63

CLAIMS:

1. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin in an amount of at least about 10 weight percent of the total of the poly(arylene ether) and the poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; a polyolefin-graft-cyclic anhydride copolymer; and a reinforcing filler.
2. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a plurality of structural units of the formula 4 wherein for each structural unit, each Q.sup.1 is independently halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarbonoxy, or C.sub.2-C.sub.8 halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Q.sup.2 is independently hydrogen, halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarbonoxy, or C.sub.2-C.sub.8 halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms.
3. The thermoplastic composition of claim 2, wherein each Q.sup.1 is independently C.sub.1-C alkyl or phenyl, and each Q.sup.2 is independently hydrogen or methyl.
4. The thermoplastic composition of claim 1, wherein the poly(arylene ether) is a copolymer of 2,6-dimethylphenol and 2,3,6-trimethylphenol.
5. The thermoplastic composition of claim 1, wherein the poly(arylene ether) is present at about 10 weight percent to about 55 weight percent, based on the total weight of the composition.
6. The thermoplastic composition of claim 1, wherein the poly(alkenyl aromatic) resin comprises at least 25% by weight of structural units derived from an alkenyl aromatic monomer of the formula 5 wherein R1 is hydrogen, C1-C8 alkyl, or halogen; Z is vinyl, halogen, or C1-C8 alkyl; and p is 0 to 5.
7. The thermoplastic composition of claim 6, wherein the poly(alkenyl aromatic) resin

comprises at least one poly(alkenyl aromatic) resin selected from the group consisting of atactic homopolystyrene, syndiotactic homopolystyrene, rubber-modified polystyrene, and mixtures comprising at least one of the foregoing poly(alkenyl aromatic) resins.

8. The thermoplastic composition of claim 1, wherein the poly(alkenyl aromatic) resin is present at about 1 weight percent to about 50 weight percent, based on the total weight of the composition.

9. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolymer or copolymer having at least about 80 weight percent of units derived from polymerization of ethylene, propylene, butylene, or a mixture thereof.

10. The thermoplastic composition of claim 1, wherein the polyolefin is a propylene polymer; wherein the propylene polymer is a homopolymer of polypropylene, or a random, graft, or block copolymer of propylene and at least one olefin selected from ethylene and C.sub.4-C.sub.10 alpha-olefins, with the proviso that the copolymer comprises at least about 80 weight percent of repeating units derived from propylene.

11. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolypropylene.

12. The thermoplastic composition of claim 1, wherein the polyolefin is present at about 10 weight percent to about 60 weight percent, based on the total weight of the composition.

13. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises: (A) at least one block derived from an alkenyl aromatic compound having the formula 6 wherein R.sup.2 and R.sup.3 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group; R.sup.4 and R.sup.8 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, a chlorine atom, or a bromine atom; and R.sup.5-R.sup.7 each independently represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group, or R.sup.4 and R.sup.5 are taken together with the central aromatic ring to form a naphthyl group, or R.sup.5 and R.sup.6 are taken together with the central aromatic ring to form a naphthyl group including; and (B) at least one block derived from a conjugated diene, in which the aliphatic unsaturated group content in the block (B) is reduced by hydrogenation.

14. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises a styrene-(ethylene-butylene)-styrene triblock copolymer.

15. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 50 to about 85 weight percent.

16. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 55 to about 70 weight percent.

17. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer is present at about 1 weight percent to about 20 weight percent, based on the total weight of the composition.

18. The thermoplastic composition of claim 1, wherein the a polyolefin-graft-cyclic anhydride copolymer is a polypropylene-graft-maleic anhydride copolymer.

19. The thermoplastic composition of claim 1, wherein the a polyolefin-graft-cyclic anhydride copolymer is present at about 0.1 to about 10 weight percent, based on the total weight of the composition.

20. The thermoplastic composition of claim 1, wherein the reinforcing filler is selected from the group consisting of glass fibers, talc, quartz fibers, carbon fibers, potassium titanate fibers, silicon carbide fibers, boron carbide fibers, gypsum fibers, aluminum oxide fibers, iron fibers, nickel fibers, copper fibers, wollastonite fibers, poly(ether ketone) fibers, polyimide benzoxazole fibers, poly(phenylene sulfide) fibers, polyester fibers, aromatic polyamide fibers, aromatic polyimide fibers, aromatic polyetherimide fibers, acrylic fibers, poly(vinyl alcohol) fibers, polytetrafluoroethylene fibers, and combinations comprising at least one of the foregoing reinforcing fillers.

21. The thermoplastic composition of claim 1, wherein the reinforcing filler comprises glass fibers having a diameter of about 2 to about 25 micrometers.

22. The thermoplastic composition of claim 1, wherein the reinforcing filler comprises talc.
23. The thermoplastic composition of claim 1, wherein the reinforcing filler comprises vapor-grown carbon fibers having an average diameter of about 3 to about 500 nanometers.
24. The thermoplastic composition of claim 1, wherein the reinforcing filler comprises a surface coating in an amount effective to increase compatibility with the polyolefin.
25. The thermoplastic composition of claim 1, wherein the reinforcing filler is present at about 1 weight percent to about 50 weight percent, based on the total weight of the composition.
26. The thermoplastic composition of claim 1, further comprising an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene.
27. The thermoplastic composition of claim 26, wherein the unhydrogenated block copolymer comprises a styrene-butadiene diblock copolymer or a styrene-butadiene-styrene triblock copolymer.
28. The thermoplastic composition of claim 26, wherein the unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene is present at about 0.5 weight percent to about 20 weight percent, based on the total weight of the composition.
29. The thermoplastic composition of claim 1, further comprising a polypropylene-polystyrene graft copolymer.
30. The thermoplastic composition of claim 29, wherein the polypropylene-polystyrene graft copolymer comprises a graft copolymer having a propylene polymer backbone and one or more styrene polymer grafts.
31. The thermoplastic composition of claim 29, wherein the polypropylene-polystyrene graft copolymer comprises about 10 to about 90 weight percent propylene polymer backbone and about 90 to about 10 weight percent styrene polymer grafts.
32. The thermoplastic composition of claim 29, wherein the polypropylene-polystyrene graft copolymer is present at about 0.5 weight percent to about 20 weight percent, based on the total weight of the composition.
33. The thermoplastic composition of claim 1, further comprising an ethylene/alpha-olefin elastomeric copolymer at about 0.5 weight percent to about 25 weight percent, based on the total weight of the composition.
34. The thermoplastic composition of claim 33, wherein the ethylene/alpha-olefin elastomeric copolymer comprises a copolymer of ethylene and at least one C.sub.3-C.sub.10 alpha-olefin.
35. The thermoplastic composition of claim 33, wherein the ethylene/alpha-olefin elastomeric copolymer comprises an ethylene-butylene rubber, an ethylene-propylene rubber, or a mixture thereof.
36. The thermoplastic composition of claim 1, further comprising a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 10 to less than 40 weight percent.
37. The thermoplastic composition of claim 1, further comprising an additive selected from the group consisting of stabilizers, mold release agents, processing aids, flame retardants, drip retardants, nucleating agents, UV blockers, dyes, pigments, particulate fillers, antioxidants, anti-static agents, blowing agents, and combinations comprising at least one of the foregoing additives.
38. The thermoplastic composition of claim 1, wherein the composition after molding exhibits a flexural modulus at 23.degree. C. according to ASTM D790 greater than about 300 kpsi.

39. The thermoplastic composition of claim 1, wherein the composition after molding exhibits a sample-to-sample variability in Flexural Modulus at 23.degree. C. of less than about 10 percent.

40. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; a polypropylene-polystyrene graft copolymer or an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and a reinforcing filler.

41. A thermoplastic composition, comprising: about 10 to about 55 weight percent of a poly(arylene ether); about 1 to about 50 weight percent of a poly(alkenyl aromatic) resin; wherein the amount of poly(alkenyl aromatic) resin is at least about 10 weight percent of the total of the poly(arylene ether) and the poly(alkenyl aromatic) resin; about 10 to about 60 weight percent of a polyolefin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight percent; about 0.1 to about 10 weight percent of a polyolefin-graft-cyclic anhydride copolymer; and about 1 to about 50 weight percent of a reinforcing filler; wherein all weight percents are based on the total weight of the composition.

42. A thermoplastic composition, comprising: about 10 to about 55 weight percent of a poly(arylene ether); about 1 to about 50 weight percent of a poly(alkenyl aromatic) resin; about 10 to about 60 weight percent of a polyolefin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight percent; about 0.5 to about 20 weight percent of a polypropylene-polystyrene graft copolymer or an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and about 1 to about 50 weight percent of a reinforcing filler; wherein all weight percents are based on the total weight of the composition.

43. A thermoplastic composition, comprising: about 10 to about 55 weight percent of a poly(arylene ether); about 1 to about 50 weight percent of a poly(alkenyl aromatic) resin; about 10 to about 60 weight percent of a polyolefin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight percent; about 1 to about 50 weight percent of a reinforcing filler; about 0.5 to about 20 weight percent of a polypropylene-polystyrene graft copolymer or an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and about 0.5 to about 25 weight percent of an ethylene/alpha-olefin elastomeric copolymer; wherein all weight percents are based on the total weight of the composition.

44. A thermoplastic composition, comprising the reaction product of: a poly(arylene ether); a poly(alkenyl aromatic) resin in an amount of at least about 10 weight percent of the total of the poly(arylene ether) and the poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; a polyolefin-graft-cyclic anhydride copolymer; and a reinforcing filler.

45. An article comprising the composition of claim 44.

46. An article comprising the composition of claim 44, wherein the article is formed using at least one method selected from the group consisting of injection molding, blow molding, extrusion, sheet extrusion, film extrusion, profile extrusion, pultrusion, compression molding, thermoforming, pressure forming, hydroforming, and vacuum forming.

47. A sheet comprising the composition of claim 44.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	RMC	Draw Desc	Image
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L9: Entry 2 of 5

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PGPUB-DOCUMENT-NUMBER: 20020156185
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TITLE: Method for the preparation of a poly(arylene ether)-polyolefin composition, and composition prepared thereby

PUBLICATION-DATE: October 24, 2002

INVENTOR-INFORMATION:

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US-CL-CURRENT: 525/88

CLAIMS:

1. A method of preparing a thermoplastic composition, comprising: melt-blending to form a first intimate blend comprising a poly(arylene ether); a poly(alkenyl aromatic) resin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and melt-blending to form a second intimate blend comprising the first intimate blend; and a polyolefin.
2. The method of claim 1, wherein melt-blending to form a first intimate blend comprises heating to a temperature of about 80.degree. C. to about 400.degree. C.
3. The method of claim 1, wherein the melt-blending to form a first intimate blend comprises mixing with at least two mixing elements.
4. The method of claim 1, wherein melt-blending to form a first intimate blend and melt-blending to form a second intimate blend collectively comprise mixing with a mixing energy input of at least about 0.20 kW-hr/kg.
5. The method of claim 1, having a throughput rate of at least about 10 kg/hour.
6. The method of claim 1, wherein the first intimate blend further comprises a polyolefin in an amount not greater than that of the polyolefin added during formation of the second intimate blend.
7. The method of claim 1, wherein the poly(arylene ether) comprises a plurality of structural units of the formula: 4wherein for each structural unit, each Q.sup.1 is independently halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Q.sup.2 is independently hydrogen, halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms.
8. The method of claim 2, wherein each Q.sup.1 is independently C.sub.1-C.sub.4 alkyl or phenyl, and each Q.sup.2 is independently hydrogen or methyl.
9. The method of claim 1, wherein the poly(arylene ether) has an intrinsic viscosity of about 0.2 to about 0.6 dL/g as measured in chloroform at 25.degree. C.
10. The method of claim 1, wherein the poly(arylene ether) comprises a copolymer of 2,6-dimethylphenol and 2,3,6-trimethylphenol.
11. The method of claim 1, wherein the first intimate blend comprises the poly (arylene ether) in an amount of about 10 to about 59 weight percent, based on the total weight of the composition.

12. The method of claim 1, wherein the poly(alkenyl aromatic) resin comprises at least 25% by weight of structural units derived from an alkenyl aromatic monomer of the formula 5 wherein R.sup.1 is hydrogen, C.sub.1-C.sub.8 alkyl, or halogen; Z is vinyl, halogen, or C.sub.1-C.sub.8 alkyl; and p is 0 to 5.
13. The method of claim 1, wherein the poly(alkenyl aromatic) resin comprises at least one poly(alkenyl aromatic) resin selected from the group consisting of atactic homopolystyrene, syndiotactic homopolystyrene, rubber-modified polystyrene, and mixtures comprising at least one of the foregoing poly(alkenyl aromatic) resins.
14. The method of claim 1, wherein the first intimate blend comprises about 1 to about 46 weight percent poly(alkenyl aromatic) resin, based on the total weight of the composition.
15. The method of claim 1, wherein the hydrogenated block copolymer comprises: (A) at least one block derived from an alkenyl aromatic compound having the formula 6 wherein R.sup.2 and R.sup.3 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group; R.sup.4 and R.sub.8 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, a chlorine atom, or a bromine atom; and R.sup.5-R.sup.7 each independently represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group, or R.sup.4 and R.sup.5 are taken together with the central aromatic ring to form a naphthyl group, or R.sup.5 and R.sup.6 are taken together with the central aromatic ring to form a naphthyl group including; and (B) at least one block derived from a conjugated diene, in which the aliphatic unsaturated group content in the block (B) is reduced by hydrogenation.
16. The method of claim 1, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 10 to about 90 weight percent.
17. The method of claim 1, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent.
18. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises a styrene-(ethylene-butylene)-styrene triblock copolymer.
19. The method of claim 1, wherein the first intimate blend comprises about 1 to about 20 weight percent hydrogenated block copolymer, based on the total weight of the composition.
20. The method of claim 1, wherein the wherein the unhydrogenated block copolymer comprises a styrene-butadiene diblock copolymer or a styrene-butadiene-styrene triblock copolymer.
21. The method of claim 1, wherein the first intimate blend comprises about 1 to about 20 weight percent of the unhydrogenated block copolymer, based on the total weight of the composition.
22. The method of claim 1, wherein the polyolefin comprises a homopolymer or copolymer having at least about 80 weight percent of units derived from polymerization of ethylene, propylene, butylene, or a mixture thereof.
23. The method of claim 1, wherein the polyolefin is a propylene polymer comprising a homopolymer of polypropylene; or a random, graft, or block copolymer of propylene and at least one olefin selected from ethylene and C.sub.4-C.sub.10 alpha-olefins, with the proviso that the copolymer comprises at least about 80 weight percent of repeating units derived from propylene.
24. The method of claim 1, wherein the polyolefin comprises a homopolypropylene.
25. The method of claim 1, wherein the second intimate blend comprises about 10 to about 60 weight percent polyolefin, based on the total weight of the composition.
26. The method of claim 1, wherein the first intimate blend and/or the second intimate blend further comprises a polypropylene-polystyrene copolymer selected from the group consisting of graft copolymers, diblock copolymers, multiblock copolymers, radial block copolymers, and combinations comprising at least one of the foregoing polypropylene-polystyrene copolymers.
27. The method of claim 26, wherein the polypropylene-polystyrene copolymer is a graft

copolymer having a propylene polymer backbone and one or more styrene polymer grafts.

28. The method of claim 27, wherein the polypropylene-polystyrene graft copolymer comprises about 50 to about 85 weight percent of the propylene polymer backbone and about 15 to about 50 weight percent of the styrene polymer grafts.

29. The method of claim 26, wherein the polypropylene-polystyrene copolymer is present in an amount of about 0.5 to about 30 weight percent, based on the total weight of the composition.

30. The method of claim 1, wherein the first intimate blend and/or the second intimate blend further comprises an ethylene/alpha-olefin elastomeric copolymer.

31. The method of claim 30, wherein the ethylene/alpha-olefin elastomeric copolymer is a copolymer of ethylene and at least one C.sub.3-C.sub.10 alpha-olefin.

32. The method of claim 30, wherein the ethylene/alpha-olefin elastomeric copolymer is an ethylene-butylene rubber, an ethylene-propylene rubber, or a mixture thereof.

33. The method of claim 30, wherein the ethylene/alpha-olefin elastomeric copolymer is present in an amount of about 1 to about 20 weight percent, based on the total weight of the composition.

34. The method of claim 1, wherein the second intimate blend further comprises at least one reinforcing filler.

35. The method of claim 34, wherein the second intimate blend further comprises a graft copolymer comprising a polyolefin backbone and polar grafts formed from one or more cyclic anhydrides.

36. The method of claim 1, further comprising blending the second intimate blend with at least one reinforcing filler.

37. The method of claim 36, further comprising blending the second intimate blend with at least one reinforcing filler and a graft copolymer comprising a polyolefin backbone and polar grafts formed from one or more cyclic anhydrides.

38. The method of claim 34 or 36, wherein the reinforcing filler is selected from the group consisting of glass fibers, talc, quartz fibers, carbon fibers, potassium titanate fibers, silicon carbide fibers, boron carbide fibers, gypsum fibers, aluminum oxide fibers, iron fibers, nickel fibers, copper fibers, wollastonite fibers, poly(ether ketone) fibers, polyimide benzoxazole fibers, poly(phenylene sulfide) fibers, polyester fibers, aromatic polyamide fibers, aromatic polyimide fibers, aromatic polyetherimide fibers, acrylic fibers, poly(vinyl alcohol) fibers, polytetrafluoroethylene fibers, and combinations comprising at least one of the foregoing reinforcing fillers.

39. The method of claim 34 or 36, wherein the reinforcing filler is glass fibers.

40. The method of claim 1, wherein the first intimate blend and/or the second intimate blend further comprises an additive selected from the group consisting of stabilizers, mold release agents, processing aids, flame retardants, drip retardants, nucleating agents, UV blockers, dyes, pigments, antioxidants, antistatic agents, and combinations comprising at least one of the foregoing additives.

41. A method of preparing a thermoplastic composition, comprising: melt-blending to form an first intimate blend comprising: about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and melt-blending to form a second intimate blend comprising: the first intimate blend; and about 10 to about 60 weight percent of a polyolefin; wherein all weight percents are based on the total weight of the composition.

42. A method of preparing a thermoplastic composition, comprising: melt-blending to form an first intimate blend comprising about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl

aromatic compound and a conjugated diene; and about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and melt-blending to form a second intimate blend comprising the first intimate blend; about 10 to about 60 weight percent of a polyolefin; and about 1 to about 20 weight percent of an ethylene/alpha-olefin elastomeric copolymer; wherein all weight percents are based on the total weight of the composition.

43. A method of preparing a thermoplastic composition, comprising: melt-blending to form an first intimate blend comprising about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and about 0.5 to about 30 weight percent of a polypropylene-polystyrene graft copolymer; and melt-blending to form a second intimate blend comprising the first intimate blend; and about 10 to about 60 weight percent of a polyolefin; wherein all weight percents are based on the total weight of the composition. *DO or 1?*

44. A method of preparing a thermoplastic composition, comprising: melt-blending to form an first intimate blend comprising: about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and melt-blending to form a second intimate blend comprising: the first intimate blend; about 10 to about 60 weight percent of a polyolefin; and about 1 to about 50 weight percent of a reinforcing filler; wherein all weight percents are based on the total weight of the composition.

45. A method of preparing a thermoplastic composition, comprising: melt-blending to form an first intimate blend comprising about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and melt-blending to form a second intimate blend comprising the first intimate blend; and about 10 to about 60 weight percent of a polyolefin; and melt-blending to form a third intimate blend comprising the second intimate blend; and about 1 to about 50 weight percent of a reinforcing filler; wherein all weight percents are based on the total weight of the composition.

46. A thermoplastic composition prepared by the method of claim 1.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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L9: Entry 3 of 5

File: PGPB

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Oct 24, 2002

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TITLE: Poly(arylene ether)-polyolefin composition and articles derived therefrom

PUBLICATION-DATE: October 24, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
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Lanning, Vincent L.	Pittsfield	MA	US	
Hartle, Thomas J.	Delmar	NY	US	
Haylock, John C.	Schenectady	NY	US	

US-CL-CURRENT: 525/64; 525/68, 525/69, 525/71

CLAIMS:

1. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin in an amount of at least about 30 weight percent of the total of the poly(arylene ether) and the poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene.
2. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a plurality of structural units of the formula 4 wherein for each structural unit, each Q.sup.1 is independently halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Q.sup.2 is independently hydrogen, halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms.
3. The thermoplastic composition of claim 2, wherein each Q.sup.1 is independently C.sub.1-C.sub.4 alkyl or phenyl, and each Q.sup.2 is independently hydrogen or methyl.
4. The thermoplastic composition of claim 1, wherein the poly(arylene ether) has an intrinsic viscosity of about 0.2 to about 0.6 dL/g as measured in chloroform at 25.degree. C.
5. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a copolymer of 2,6-dimethylphenol and 2,3,6-trimethylphenol.
6. The thermoplastic composition of claim 1, comprising about 10 to about 59 weight percent poly(arylene ether), based on the total weight of the composition.
7. The thermoplastic composition of claim 1, wherein the poly(alkenyl aromatic) resin comprises at least 25% by weight of structural units derived from an alkenyl aromatic monomer of the formula 5 wherein R.sup.1 is hydrogen, C.sub.1-C.sub.8 alkyl, or halogen; Z is vinyl, halogen, or C.sub.1-C.sub.8 alkyl; and p is 0 to 5.
8. The thermoplastic composition of claim 1, wherein the poly(alkenyl aromatic) resin comprises at least one poly(alkenyl aromatic) resin selected from the group consisting of atactic homopolystyrene, syndiotactic homopolystyrene, rubber-modified polystyrene, and mixtures comprising at least one of the foregoing poly(alkenyl aromatic) resins.
9. The thermoplastic composition of claim 1, comprising about 4 to about 46 weight percent poly(alkenyl aromatic) resin, based on the total weight of the composition.
10. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolymer or copolymer having at least about 80 weight percent of units derived from polymerization of ethylene, propylene, butylene, or a mixture thereof.
11. The thermoplastic composition of claim 1, wherein the polyolefin is a propylene polymer; and wherein the propylene polymer is a homopolymer of polypropylene, or a random, graft, or block copolymer of propylene and at least one olefin selected from ethylene and C.sub.4-C.sub.10 alpha-olefins, with the proviso that the copolymer comprises at least about 80 weight percent of repeating units derived from propylene.
12. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolypropylene.
13. The thermoplastic composition of claim 1, comprising about 10 to about 70 weight percent of the polyolefin, based on the total weight of the composition.
14. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises: (A) at least one block derived from an alkenyl aromatic compound having the formula 6 wherein R.sup.2 and R.sup.3 each represent a hydrogen atom, a C.sub.1-C.sub.8

alkyl group, or a C.sub.2-C.sub.8 alkenyl group; R.sup.4 and R.sup.8 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, a chlorine atom, or a bromine atom; and R.sup.5-R.sup.7 each independently represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group, or R.sup.4 and R.sup.5 are taken together with the central aromatic ring to form a naphthyl group, or R.sup.5 and R.sup.6 are taken together with the central aromatic ring to form a naphthyl group including; and (B) at least one block derived from a conjugated diene, in which the aliphatic unsaturated group content in the block (B) is reduced by hydrogenation.

15. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises a styrene-(ethylene-butylene)-styrene triblock copolymer.

16. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 50 to about 85 weight percent.

17. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 55 to about 70 weight percent.

18. The thermoplastic composition of claim 1, comprising about 1 to about 20 weight percent of the hydrogenated block copolymer, based on the total weight of the composition.

19. The thermoplastic composition of claim 1, wherein the unhydrogenated block copolymer comprises a styrene-butadiene diblock copolymer, a styrene-butadiene-styrene triblock copolymer, or a styrene-butadiene radial teleblock copolymer.

20. The thermoplastic composition of claim 1, comprising about 1 to about 20 weight percent of the unhydrogenated block copolymer.

21. The thermoplastic composition of claim 1, further comprising a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 10 to less than 40 weight percent.

22. The thermoplastic composition of claim 1, further comprising a polypropylene-polystyrene graft copolymer.

23. The thermoplastic composition of claim 22, wherein the polypropylene-polystyrene graft copolymer comprises a graft copolymer having a propylene polymer backbone and one or more styrene polymer grafts.

24. The thermoplastic composition of claim 23, wherein the polypropylene-polystyrene graft copolymer comprises about 10 to about 90 weight percent of the propylene polymer backbone and about 90 to about 10 weight percent of the styrene polymer grafts.

25. The thermoplastic composition of claim 22, comprising about 0.5 to about 15 weight percent of the polypropylene-polystyrene graft copolymer, based on the total weight of the composition.

26. The thermoplastic composition of claim 1, further comprising an ethylene/alpha-olefin elastomeric copolymer.

27. The thermoplastic composition of claim 26, wherein the ethylene/alpha-olefin elastomeric copolymer comprises a copolymer of ethylene and at least one C.sub.3-C.sub.10 alpha-olefin.

28. The thermoplastic composition of claim 26, wherein the ethylene/alpha-olefin elastomeric copolymer comprises an ethylene-butylene rubber, an ethylene-propylene rubber, or a mixture thereof.

29. The thermoplastic composition of claim 26, comprising about 1 to about 20 weight percent of the ethylene/alpha-olefin elastomeric copolymer.

30. The thermoplastic composition of claim 1, further comprising at least one additive selected from the group consisting of stabilizers, mold release agents, processing aids, flame retardants, drip retardants, nucleating agents, UV blockers, dyes, pigments, particulate fillers, reinforcing fillers, conductive fillers, anti-static agents, blowing agents, and antioxidants.

31. The thermoplastic composition of claim 1, wherein the composition is substantially free of reinforcing fillers.
32. The thermoplastic composition of claim 1, wherein the composition after molding has less than about 10% batch-to-batch variability in Izod Notched Impact Strength at 23 C measured according to ASTM D256.
33. The thermoplastic composition of claim 1, wherein the composition after molding has less than about 5% batch-to-batch variability in Flexural Modulus at 23.degree. C. measured according to ASTM D790.
34. The composition of claim 1, wherein the composition after molding has a flexural modulus at 23.degree. C. greater than about 100 kpsi and an Izod notched impact strength greater than about 1 ft-lb/in.
35. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; wherein the poly(arylene ether) and the poly(alkenyl aromatic) resin form a single phase having a glass transition temperature at least about 20.degree. C. greater than the glass transition temperature of the poly(alkenyl aromatic) resin alone.
36. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; wherein the poly(arylene ether) and the poly(alkenyl aromatic) resin form a single phase having a glass transition temperature up to about 15.degree. C. greater than the melting temperature of the polyolefin alone.
37. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; wherein the poly(arylene ether) and the poly(alkenyl aromatic) resin form a single phase having a glass transition temperature of about 130.degree. C. to about 180.degree. C.
38. A thermoplastic composition, comprising: a poly(arylene ether); a poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and a polypropylene-polystyrene graft copolymer or an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene.
39. A thermoplastic composition, comprising: about 10 to about 59 weight percent of a poly(arylene ether); about 3 to about 46 weight percent of a poly(alkenyl aromatic) resin, with the proviso that the weight ratio of the poly(alkenyl aromatic) resin to the poly(arylene ether) is at least about 3:7; about 10 to about 70 weight percent of a polyolefin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; wherein all weight percents are based on the total weight of the composition.
40. A thermoplastic composition, comprising: about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 10 to about 70 weight percent of a polyolefin; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; about 1 to about 20 weight percent of an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene; and about 0.5 to about 15 weight percent of a polypropylene-polystyrene graft copolymer; wherein all weight percents are based on the total weight of the

composition.

41. A thermoplastic composition, comprising: about 10 to about 59 weight percent of a poly(arylene ether); about 1 to about 46 weight percent of a poly(alkenyl aromatic) resin; about 1 to about 20 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; about 10 to about 70 weight percent of a polyolefin; about 1 to about 20 weight percent of an ethylene/alpha-olefin elastomeric copolymer; about 1 to about 20 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and about 0.5 to about 15 weight percent of a polypropylene-polystyrene graft copolymer; wherein all weight percents are based on the total weight of the composition.

42. A thermoplastic composition, comprising the reaction product of: a poly(arylene ether); a poly(alkenyl aromatic) resin in an amount of at least about 30 weight percent of the total of the poly(arylene ether) and the poly(alkenyl aromatic) resin; a polyolefin; a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 40 to about 90 weight percent; and an unhydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene.

43. An article comprising the composition of claim 42.

44. An article comprising the composition of claim 42, wherein the article is formed using at least one method selected from the group consisting of injection molding, blow molding, extrusion, sheet extrusion, film extrusion, profile extrusion, pultrusion, compression molding, thermoforming, pressure forming, hydroforming, vacuum forming, and foam molding.

45. An article comprising the composition of claim 42, wherein the article is formed using blow molding or foam molding.

46. A sheet comprising the composition of claim 42.

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments
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TITLE: Poly(arylene ether)-polyolefin compositions and articles derived therefrom

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INVENTOR-INFORMATION:

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CLAIMS:

1. A thermoplastic composition, comprising: about 15 to about 35 weight percent of a poly(arylene ether); about 15 to about 46 weight percent of a homopolymer of an alkenyl aromatic monomer; about 10 to about 35 weight percent of a polyolefin; about 1 to about 15 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight

percent; and about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; wherein the composition is substantially free of rubber-modified poly(alkenyl aromatic) resin; and wherein all weight percents are based on the total weight of the composition.

2. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a plurality of structural units of the formula 5 wherein for each structural unit, each Q.sup.1 is independently halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarbonoxy, or C.sub.2-C.sub.8 halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Q.sup.2 is independently hydrogen, halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarbonoxy, or C.sub.2-C.sub.8 halohydrocarbonoxy wherein at least two carbon atoms separate the halogen and oxygen atoms.

3. The thermoplastic composition of claim 2, wherein each Q.sup.1 is independently C.sub.1-C alkyl or phenyl, and each Q.sup.2 is independently hydrogen or methyl.

4. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a copolymer of 2,6-dimethylphenol and 2,3,6-trimethylphenol.

5. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer is a polymerization product of an alkenyl aromatic monomer of the formula 6 wherein R.sup.1 is hydrogen, C.sub.1-C.sub.8 alkyl, or halogen; Z is vinyl, halogen, or C.sub.1-C.sub.8 alkyl; and p is 0 to 5.

6. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer comprises homopolystyrene.

7. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer comprises atactic homopolystyrene.

8. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolymer or copolymer having at least about 80 weight percent of units derived from polymerization of ethylene, propylene, butylene, or a mixture thereof.

9. The thermoplastic composition of claim 1, wherein the polyolefin is a propylene polymer; and wherein the propylene polymer comprises a homopolymer of polypropylene, or a random, graft, or block copolymer of propylene and at least one olefin selected from ethylene and C.sub.4-C.sub.10 alpha-olefins, with the proviso that the copolymer comprises at least about 80 weight percent of repeating units derived from propylene.

10. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolypropylene.

11. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises: (A) at least one block derived from an alkenyl aromatic compound having the formula 7 wherein R.sup.2 and R.sup.3 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group; R.sup.4 and R.sup.8 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, a chlorine atom, or a bromine atom; and R.sup.5-R.sup.7 each independently represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.8-C.sub.8 alkenyl group, or R.sup.4 and R.sup.5 are taken together with the central aromatic ring to form a naphthyl group, or R.sup.5 and R.sup.6 are taken together with the central aromatic ring to form a naphthyl group including; and (B) at least one block derived from a conjugated diene, in which the aliphatic unsaturated group content in the block (B) is reduced by hydrogenation.

12. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises a styrene-(ethylene-butylene)-styrene triblock copolymer.

13. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 50 to about 85 weight percent.

14. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 55 to about 70 weight percent.

15. The thermoplastic composition of claim 1, wherein the unhydrogenated block copolymer comprises a styrene-butadiene diblock copolymer or a styrene-butadiene-styrene triblock copolymer.

16. The thermoplastic composition of claim 1, further comprising a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 10 to less than 40 weight percent.

17. The thermoplastic composition of claim 1, further comprising a polypropylene-polystyrene graft copolymer having a propylene polymer backbone and one or more styrene polymer grafts.

18. The thermoplastic composition of claim 17, wherein the polypropylene-polystyrene graft copolymer comprises about 10 to about 90 weight percent propylene polymer backbone and about 90 to about 10 weight percent styrene polymer grafts.

19. The composition of claim 1, further comprising about 2 to about 20 weight percent of an ethylene/alpha-olefin elastomeric copolymer.

20. The thermoplastic composition of claim 19, wherein the ethylene/alpha-olefin elastomeric copolymer comprises a copolymer of ethylene and at least one C.sub.3-C.sub.10 alpha-olefin.

21. The thermoplastic composition of claim 19, wherein the ethylene/alpha-olefin elastomeric copolymer comprises an ethylene-butylene rubber, an ethylene-propylene rubber, or a mixture thereof.

22. The composition of claim 1, wherein the composition is substantially free of reinforcing fillers.

23. The composition of claim 1, wherein the composition after molding has a flexural modulus measured at 23.degree. C. according to ASTM D256 of at least about 230,000 pounds per square inch.

24. The composition of claim 1, wherein the composition after molding has an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 1 foot-pound per inch.

25. The composition of claim 1, wherein the composition after molding has an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 2 foot-pounds per inch.

26. The composition of claim 1, wherein the composition after molding has a heat distortion temperature measured at 66 psi according to ASTM D648 of at least about 240.degree. F.

27. The composition of claim 1, wherein the composition after molding has a flexural modulus at 23.degree. C. of at least about 230,000 pounds per square inch and an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 4 foot-pounds per inch.

28. The composition of claim 1, wherein the composition after molding has a flexural modulus at 23.degree. C. of at least about 300,000 pounds per square inch and an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 1.5 foot-pounds per inch.

29. A thermoplastic composition, comprising: about 15 to about 35 weight percent of a poly(arylene ether); about 15 to about 46 weight percent of a homopolystyrene; about 10 to about 35 weight percent of a polyolefin; about 1 to about 15 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight percent; about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and about 2 to about 20 weight percent of an ethylene/alpha-olefin elastomeric copolymer; wherein the composition is substantially free of rubber-modified poly(alkenyl aromatic) resin; and wherein all weight percents are based on the total weight of the composition.

30. A thermoplastic composition, comprising: about 15 to about 32 weight percent of a poly(arylene ether) that is the polymerization product of 2,6-dimethylphenol, 2,3,6-trimethylphenol, or a combination thereof; about 20 to about 46 weight percent of an atactic homopolystyrene; about 12 to about 30 weight percent of a homopolypropylene;

and about 2 to about 13 weight percent of a styrene-(ethylene-butylene)-styrene triblock copolymer having a styrene content of about 50 weight percent to about 75 weight percent; about 2 to about 13 weight percent of a styrene-butadiene-styrene triblock copolymer; wherein the composition is substantially free of rubber-modified poly(alkenyl aromatic) resin; and wherein all weight percents are based on the total weight of the composition.

31. A thermoplastic composition, comprising the reaction product of: about 15 to about 35 weight percent of a poly(arylene ether); about 15 to about 46 weight percent of a homopolymer of an alkenyl aromatic monomer; about 10 to about 35 weight percent of a polyolefin; about 1 to about 15 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of about 40 to about 90 weight percent; and about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; wherein the composition is substantially free of rubber-modified poly(alkenyl aromatic) resin; and wherein all weight percents are based on the total weight of the composition.

32. An article comprising the composition of claim 31.

33. An automotive component comprising the composition of claim 31.

34. An automotive underhood component comprising the composition of claim 31.

35. A food tray comprising the composition of claim 31.

36. A sheet comprising the composition of claim 31.

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TITLE: Glass-filled poly(arylene ether)-polyolefin composition and articles derived therefrom

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US-CL-CURRENT: 525/88; 525/89

CLAIMS:

1. A thermoplastic composition, comprising: about 10 to about 40 weight percent of a poly(arylene ether); about 2 to about 35 weight percent of a homopolymer of an alkenyl aromatic monomer, wherein the weight ratio of the homopolymer of an alkenyl aromatic monomer to the poly(arylene ether) is at least about 1:10; about 20 to about 50 weight percent of a polyolefin; about 1 to about 12 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of 40 to about 90 weight percent; about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and 20 weight percent to about 40 weight percent of glass fibers; wherein all weight percents are based on the total weight of the composition.

all except ch 37 which has specific rubber instead of unhydrogenated

2. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a plurality of structural units of the formula 5 wherein for each structural unit, each Q.sup.1 is independently halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms; and each Q.sup.2 is independently hydrogen, halogen, primary or secondary C.sub.1-C.sub.8 alkyl, phenyl, C.sub.1-C.sub.8 haloalkyl, C.sub.1-C.sub.8 aminoalkyl, C.sub.1-C.sub.8 hydrocarboxy, or C.sub.2-C.sub.8 halohydrocarboxy wherein at least two carbon atoms separate the halogen and oxygen atoms.
3. The thermoplastic composition of claim 2, wherein each Q.sup.1 is independently C--C alkyl or phenyl, and each Q.sup.2 is independently hydrogen or methyl.
4. The thermoplastic composition of claim 1, wherein the poly(arylene ether) comprises a copolymer of 2,6-dimethylphenol and 2,3,6-trimethylphenol.
5. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer of the formula 6 wherein R.sup.1 is hydrogen, C.sub.1-C.sub.8 alkyl, or halogen; Z is vinyl, halogen, or C.sub.1-C.sub.8 alkyl; and p is 0 to 5.
6. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer comprises homopolystyrene.
7. The composition of claim 1, wherein the homopolymer of an alkenyl aromatic monomer comprises atactic homopolystyrene.
8. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolymer or copolymer having at least about 80 weight percent of units derived from polymerization of ethylene, propylene, butylene, or a mixture thereof.
9. The thermoplastic composition of claim 1, wherein the polyolefin is a propylene polymer; and wherein the propylene polymer comprises a homopolymer of polypropylene, or a random, graft, or block copolymer of propylene and at least one olefin selected from ethylene and C.sub.4-C.sub.10 alpha-olefins, with the proviso that the copolymer comprises at least about 80 weight percent of repeating units derived from propylene.
10. The thermoplastic composition of claim 1, wherein the polyolefin comprises a homopolypropylene having a crystalline content of at least about 20%.
11. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises: (A) at least one block derived from an alkenyl aromatic compound having the formula 7 wherein R.sup.2 and R.sup.3 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group; R.sup.4 and R.sup.8 each represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, a chlorine atom, or a bromine atom; and R.sup.5-R.sup.7 each independently represent a hydrogen atom, a C.sub.1-C.sub.8 alkyl group, or a C.sub.2-C.sub.8 alkenyl group, or R.sup.4 and R.sup.5 are taken together with the central aromatic ring to form a naphthyl group, or R.sup.5 and R.sup.6 are taken together with the central aromatic ring to form a naphthyl group including; and (B) at least one block derived from a conjugated diene, in which the aliphatic unsaturated group content in the block (B) is reduced by hydrogenation.
12. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer comprises a styrene-(ethylene-butylene)-styrene triblock copolymer.
13. The thermoplastic composition of claim 1, wherein the hydrogenated block copolymer has a styrene content of about 50 to about 85 weight percent.
14. The thermoplastic composition of claim 1, wherein the unhydrogenated block copolymer comprises a styrene-butadiene diblock copolymer or a styrene-butadiene-styrene triblock copolymer.
15. The thermoplastic composition of claim 1, wherein the glass fibers have a diameter of about 2 to about 25 micrometers.
16. The thermoplastic composition of claim 1, further comprising about 0.5 to about 10 weight percent of a polypropylene-polystyrene graft copolymer having a propylene polymer backbone and one or more styrene polymer grafts.
17. The thermoplastic composition of claim 16, wherein the polypropylene-polystyrene

graft copolymer comprises about 10 to about 90 weight percent propylene polymer backbone and about 90 to about 10 weight percent styrene polymer grafts.

18. The composition of claim 1, further comprising about 1 to about 15 weight percent of an ethylene/alpha-olefin elastomeric copolymer.

19. The thermoplastic composition of claim 18, wherein the ethylene/alpha-olefin elastomeric copolymer comprises a copolymer of ethylene and at least one C.sub.3-C.sub.10 alpha-olefin.

20. The thermoplastic composition of claim 18, wherein the ethylene/alpha-olefin elastomeric copolymer comprises an ethylene-butylene rubber, an ethylene-propylene propylene rubber, or a mixture thereof.

21. The composition of claim 1, further comprising about 1 to about 40 weight percent, based on the total weight of the composition, of a rubber-modified poly(alkenyl aromatic) resin comprising a polymer derived from at least one alkenyl aromatic monomer, and further comprising a rubber modifier in the form of a blend and/or a graft.

22. The thermoplastic composition of claim 21, wherein the alkenyl aromatic monomer has the formula $\text{R}^{\text{sup.1}}$ is hydrogen, C.sub.1-C.sub.8 alkyl, or halogen; Z is vinyl, halogen, or C.sub.1-C.sub.8 alkyl; and p is 0 to 5.

23. The thermoplastic composition of claim 21, wherein the rubber modifier comprises a polymerization product of at least one C.sub.4-C.sub.10 nonaromatic diene monomer.

24. The composition of claim 1, wherein the composition is substantially free of a rubber-modified poly(alkenyl aromatic) resin.

25. The thermoplastic composition of claim 1, further comprising about 0.1 to about 10 weight percent of a polyolefin-graft-cyclic anhydride copolymer.

26. The thermoplastic composition of claim 1, further comprising about 1 to about 20 weight percent of a hydrogenated block copolymer of an alkenyl aromatic compound and a conjugated diene, wherein the hydrogenated block copolymer has an alkenyl aromatic content of about 10 to less than 40 weight percent.

27. The thermoplastic composition of claim 1, further comprising an additive selected from the group consisting of stabilizers, mold release agents, processing aids, flame retardants, drip retardants, nucleating agents, UV blockers, dyes, pigments, particulate fillers, antioxidants, anti-static agents, blowing agents, and combinations comprising at least one of the foregoing additives.

28. The composition of claim 1, wherein the composition after molding has a flexural modulus measured at 23.degree. C. according to ASTM D790 greater than 500,000 pounds per square inch.

29. The composition of claim 1, wherein the composition after molding has an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 1 foot-pound per inch.

30. The composition of claim 1, wherein the composition after molding has an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 2 foot-pounds per inch.

31. The composition of claim 1, wherein the composition after molding has an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 3 foot-pounds per inch.

32. The composition of claim 1, wherein the composition after molding has a heat distortion temperature measured at 66 psi according to ASTM D648 at least about 275.degree. F.

33. The composition of claim 1, wherein the composition after molding has a flexural modulus measured at 23.degree. C. according to ASTM D790 greater than 500,000 pounds per square inch and an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 2 foot-pounds per inch.

34. The composition of claim 1, wherein the composition after molding has a flexural modulus measured at 23.degree. C. according to ASTM D790 of at least about 1,000,000 pounds per square inch and an Izod Notched Impact strength measured at 23.degree. C. according to ASTM D256 of at least about 1.5 foot-pounds per inch.

35. A thermoplastic composition, comprising: about 10 to about 40 weight percent of a poly(arylene ether) that is the polymerization product of 2,6-dimethylphenol, 2,3,6-trimethylphenol, or a combination thereof; about 2 to about 35 weight percent of a homopolymer of an alkenyl aromatic monomer, wherein the weight ratio of the homopolymer of an alkenyl aromatic monomer to the poly(arylene ether) is at least about 1:10; about 20 to about 50 weight percent of a polyolefin; about 0.1 to about 10 weight percent of a polyolefin-graft-cyclic anhydride copolymer; about 1 to about 12 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of 40 to about 90 weight percent; about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and 20 weight percent to about 40 weight percent of glass fibers; wherein all weight percents are based on the total weight of the composition.

36. A thermoplastic composition, comprising: about 10 to about 40 weight percent of a poly(arylene ether) that is the polymerization product of 2,6-dimethylphenol, 2,3,6-trimethylphenol, or a combination thereof; about 2 to about 35 weight percent of a homopolymer of an alkenyl aromatic monomer, wherein the weight ratio of the homopolymer of an alkenyl aromatic monomer to the poly(arylene ether) is at least about 1:10; about 20 to about 50 weight percent of a polyolefin; about 1 to about 12 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of 40 to about 90 weight percent; about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; about 1 to about 15 weight percent of an ethylene/alpha-olefin elastomeric copolymer; and 20 to about 40 weight percent of glass fibers; wherein all weight percents are based on the total weight of the composition.

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37. A thermoplastic composition, comprising: about 15 to about 35 weight percent of a poly(arylene ether) that is the polymerization product of 2,6-dimethylphenol, 2,3,6-trimethylphenol, or a combination thereof; about 3.5 to about 20 weight percent of a homopolymer of a homopolystyrene; about 2 to about 40 weight percent of a homopolypropylene; about 2 to about 10 weight percent of a styrene-(ethylene-butylene)-styrene triblock copolymer having an alkenyl aromatic content of about 55 to about 75 weight percent; about 1 to about 7 weight percent of a styrene-butadiene-styrene triblock copolymer; about 1 to about 10 weight percent of an ethylene-butylene rubber, an ethylene-propylene rubber, or a mixture thereof; and 20 to about 40 weight percent of glass fibers having a diameter of about 10 to about 20 micrometers; wherein all weight percents are based on the total weight of the composition.

38. A thermoplastic composition, comprising the reaction product of: about 10 to about 40 weight percent of a poly(arylene ether); about 2 to about 35 weight percent of a homopolymer of an alkenyl aromatic monomer, wherein the weight ratio of the homopolymer of an alkenyl aromatic monomer to the poly(arylene ether) is at least about 1:10; about 20 to about 50 weight percent of a polyolefin; about 1 to about 12 weight percent of a hydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene having an alkenyl aromatic content of 40 to about 90 weight percent; about 1 to about 15 weight percent of an unhydrogenated block copolymer of alkenyl aromatic compound and a conjugated diene; and 20 weight percent to about 40 weight percent of glass fibers; wherein all weight percents are based on the total weight of the composition.

39. An article comprising the composition of claim 38.

40. An automotive component comprising the composition of claim 38.

41. An automotive front-end module comprising the composition of claim 38.

42. An automotive grill opening reinforcement comprising the composition of claim 38.

43. A sheet comprising the composition of claim 38.

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